

Abstract of the Disclosure

An optical identification element 8 includes an optical substrate 10 having at least one diffraction grating 12 disposed therein. The grating 12 has a one or more of
5 colocated pitches Λ which represent a unique identification N bit digital code that is detected when illuminated by incident light 24. The incident light 24 may be directed transversely onto the side or onto an end of the substrate 10 with a narrow band (single wavelength) or multiple wavelength source, in which case the code is represented by a spatial distribution of light or a wavelength spectrum, respectively.
10 The element 8 can provide a large number of unique codes, e.g., greater than 67 million codes, and can withstand harsh environments. The element 8 can be used in any application that requires sorting, tagging, tracking or identification, and can be made on a micron scale "microbeads" if desired, or larger "macro-elements" for larger applications. The code may be digital binary or may be other numerical bases.

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